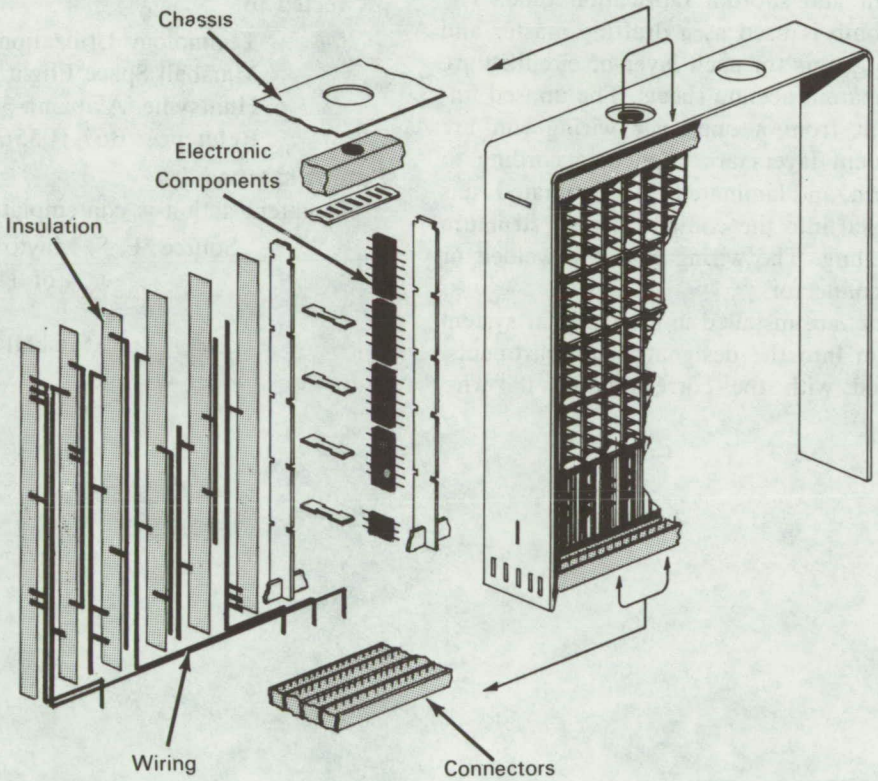
NASA TECH BRIEF

Reparable, High-Density Microelectronic Module Provides Effective Heat Sink



The problem:

To develop a readily reparable modular system for packaging microelectronic flat packs and miniature discrete components that will provide an effective heat sink for electric power dissipation in the absence of convective cooling means. The package must be light in weight, rugged, of simple construction, and be compatible with other miniature, discrete electronic components.

The solution:

A three-dimensional compartmented structure incorporating etched phosphor bronze sheets and frames with etched wire conductors.

How it's done:

The module compartments and frame are made of etched spring tempered, thin gage, phosphor bronze sheets. A tabs-and-slots method is used to assemble

(continued overleaf)

the etched sheets into an easily fabricated and self-jigging rigid structure. The mechanical joints of the module compartments, module frame, and chassis are soldered to solidify the system.

To facilitate the subsequent solder-joining process, each etched part is first coated with solder. The small etched parts are then attached to each other and to a frame for ease in handling. These frames or sheets of etched parts are solder-coated by passing them through a wire mesh solder coater. The resulting thin, uniform coating of solder is sufficient to subsequently join the parts by simply heating the joints to cause the solder to flow together. The completed structure is not only rigid, strong, lightweight, and corrosion resistant, but also affords a good thermal path.

A master wiring comb was developed to facilitate the wiring layout and shorten fabrication time. The master wiring comb is used as a drafting master and the desired wiring runs for each layer of circuitry are colored on transparent acetate sheets. The unused fingers which result from a one-layer wiring run are clipped. Subsequent layers are clipped, according to the desired pattern, and laminated. The laminated runs are then assembled into the compartmented structure by adhesive bonding. The wiring runs are welded or soldered to the connector.

These flat packs are installed in the modular system by inserting them into the designated compartments. They are aligned with the corresponding flat wire finger which protrudes from the flat wire assembly and connected by pulse soldering to enable later repairs. The individual leads can be pulse-soldered or multiple-soldered by the use of a resistance soldering device, which contacts five leads at a time. The flat packs and flat wiring assembly leads are pretinned to eliminate the need for additional solder or flux in the soldering process.

Notes:

1. The round component leads from microminiature components require pretinning for effective use of pulse soldering.
2. Large, bulkier components, such as miniature transformers, can be used in the module by clipping out frame members during assembly.
3. Inquiries concerning this innovation may be directed to:

   Technology Utilization Officer
   Marshall Space Flight Center
   Huntsville, Alabama 35812
   Reference: B67-10356

Patent status:

No patent action is contemplated by NASA.

Source: F. F. Maytone and K. J. Carlson
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